

## Differentiated Instruction for Math

### **What is Differentiated Instruction?**

Differentiated instruction, also called differentiation, is a process through which teachers enhance learning by matching student characteristics to instruction and assessment. Differentiated instruction allows all students to access the same classroom curriculum by providing entry points, learning tasks, and outcomes that are tailored to students' needs (Hall, Strangman, & Meyer, 2003). Differentiated instruction is not a single strategy, but rather an approach to instruction that incorporates a variety of strategies.

Teachers can differentiate content, process, and/or product for students (Tomlinson, 1999). Differentiation of content refers to a change in the material being learned by a student. For example, if the classroom objective is for all students to subtract using renaming, some of the students may learn to subtract two-digit numbers, while others may learn to subtract larger numbers in the context of word problems. Differentiation of process refers to the way in which a student accesses material. One student may explore a learning center, while another student collects information from the web. Differentiation of product refers to the way in which a student shows what he or she has learned. For example, to demonstrate understanding of a geometric concept, one student may solve a problem set, while another builds a model.

When teachers differentiate, they do so in response to a student's readiness, interest, and/or learning profile. Readiness refers to the skill level and background knowledge of the child. Interest refers to topics that the student may want to explore or that will motivate the student. This can include interests relevant to the content area as well as outside interests of the student. Finally, a student's learning profile includes learning style (i.e., a visual, auditory, tactile, or kinesthetic learner), grouping preferences (i.e., individual, small group, or large group), and environmental preferences (i.e., lots of space or a quiet area to work). A teacher may differentiate based on any one of these factors or any combination of factors (Tomlinson, 1999).

### **How Is it Implemented?**

Implementation looks different for each student and each assignment. Before beginning instruction, teachers should do three things:

1. Use diagnostic assessments to determine student readiness. These assessments can be formal or informal. Teachers can give pre-tests, question students about their background knowledge, or use KWL charts (charts that ask students to identify what they already **K**now, what they **W**ant to know, and what they have **L**earned about a topic).
2. Determine student interest. This can be done by using interest inventories and/or including students in the planning process. Teachers can ask students to tell them

what specific interests they have in a particular topic, and then teachers can try to incorporate these interests into their lessons.

3. Identify student learning styles and environmental preferences. Learning styles can be measured using learning style inventories. Teachers can also get information about student learning styles by asking students how they learn best and by observing student activities. Identifying environmental preferences includes determining whether students work best in large or small groups and what environmental factors might contribute to or inhibit student learning. For example, a student might need to be free from distraction or have extra lighting while he or she works.

Teachers incorporate different instructional strategies based on the assessed needs of their students. Throughout a unit of study, teachers should assess students on a regular basis. This assessment can be formal, but is often informal and can include taking anecdotal notes on student progress, examining students' work, and asking the student questions about his or her understanding of the topic. The results of the assessment could then be used to drive further instruction.

### **What Does it Look Like for Math?**

Math instruction can be differentiated to allow students to work on skills appropriate to their readiness level and to explore mathematics applications. The chart below offers a variety of strategies that can be used.

<b>Strategy</b>	<b>Focus of Differentiation</b>	<b>Definition</b>	<b>Example</b>
Tiered assignments	Readiness	Tiered assignments are designed to instruct students on essential skills that are provided at different levels of complexity, abstractness, and open-endedness. The curricular content and objective(s) are the same, but the process and/or product are varied according to the student's level of readiness.	In a unit on measurement, some students are taught basic measurement skills, including using a ruler to measure the length of objects. Other students can apply measurement skills to problems involving perimeter.
Compacting	Readiness	Compacting is the process of adjusting instruction to account for prior student mastery of learning objectives. Compacting involves a three-step process: (1) assess the student to determine his/her level of knowledge on the material to be studied and determine what he/she still	A third grade class is learning to identify the parts of fractions. Diagnostics indicate that two students already know the parts of fractions. These students are excused from completing the identifying activities, and are taught to add and

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		needs to master; (2) create plans for what the student needs to know, and excuse the student from studying what he/she already knows; and (3) create plans for freed-up time to be spent in enriched or accelerated study.	subtract fractions.
Interest Centers or Interest Groups	Readiness Interest	Interest centers (usually used with younger students) and interest groups (usually used with older students) are set up so that learning experiences are directed toward a specific learner interest. Allowing students to choose a topic can be motivating to them.	<p>Interest Centers - Centers can focus on specific math skills, such as addition, and provide activities that are high interest, such as counting jelly beans or adding the number of eyes on two aliens.</p> <p>Interest Groups - Students can work in small groups to research a math topic of interest, such as how geometry applies to architecture or how math is used in art.</p>
Flexible Grouping*	Readiness Interest Learning Profile	Students work as part of many different groups depending on the task and/or content. Sometimes students are placed in groups based on readiness, other times they are placed based on interest and/or learning profile. Groups can either be assigned by the teacher or chosen by the students. Students can be assigned purposefully to a group or assigned randomly. This strategy allows students to work with a wide variety of peers and keeps them from being labeled as advanced or struggling.	The teacher may assign groups based on readiness for direct instruction on algebraic concepts, and allow students to choose their own groups for projects that investigate famous mathematicians.

\* More information about grouping strategies can be found in *Strategies to Improve Access to the General Education Curriculum*. Available at [http://www.k8accesscenter.org/training\\_resources/curricular\\_materials.asp](http://www.k8accesscenter.org/training_resources/curricular_materials.asp)

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Learning Contracts	Readiness Learning Profile	Learning contracts begin with an agreement between the teacher and the student. The teacher specifies the necessary skills expected to be learned by the student and the required components of the assignment, while the student identifies methods for completing the tasks. This strategy (1) allows students to work at an appropriate pace; (2) can target learning styles; and (3) helps students work independently, learn planning skills, and eliminate unnecessary skill practice.	A student decides to follow a football team over a two-month period and make inferences about players' performances based on their scoring patterns and physical characteristics. The student, with the teacher's guidance, develops a plan for collecting and analyzing the data and conducting research about football. The student decides to create a PowerPoint presentation to present his or her findings to the class.
Choice Boards	Readiness Interest Learning Profile	Choice boards are organizers that contain a variety of activities. Students can choose one or several activities to complete as they learn a skill or develop a product. Choice boards can be organized so that students are required to choose options that focus on several different skills.	Students are given a choice board that contains a list of possible activities they can complete to learn about volume. For example, students can choose to complete an inquiry lesson where they measure volume using various containers, use a textbook to read about measuring volume, or watch a video in which the steps are explained. The activities are based on the following learning styles: visual, auditory, kinesthetic, and tactile. Students must complete two activities from the board and must choose these activities from two different learning styles.

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## References & Resources

Hall, T., Strangman, N., & Meyer, A. (2003). *Differentiated instruction and implications for UDL implementation*. National Center on Accessing the General Curriculum. Retrieved July 9, 2004 from:

[http://www.k8accesscenter.org/training\\_resources/udl/diffinstruction.asp](http://www.k8accesscenter.org/training_resources/udl/diffinstruction.asp)

Tomlinson, C.A. (1999). *How to differentiate instruction in mixed-ability classrooms*. Alexandria, VA: ASCD.

<http://www.cast.org/ncac/index.cfm?i=2876> – This site contains an article by Tracy Hall at the National Center for Accessing the General Curriculum. The article discusses differentiation as it applies to the general education classroom.

<http://members.shaw.ca/priscillatheroux/differentiatingstrategies.html> - The Enhancing Learning with Technology site provides explanations for various differentiation strategies.

<http://www.webmath.com/> - This mathematics Web site provides assistance with solving math problems.

For additional information on this or other topics, please contact The Access Center at [accesscenter@air.org](mailto:accesscenter@air.org).

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